

**THREE NEW SPECIES OF  
CAENAUGOCHLORA (CTENAUGOCHLORA)  
(HYMENOPTERA: HALICTIDAE)**

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*Abstract.*—Three new species of the augochlorine genus *Caenaugochlora* subgenus *Ctenaugochlora* are described: *Caenaugochlora (Ctenaugochlora) donnae* n.sp. and *C. (C.) beethoveni* n.sp. both from Costa Rica, and *C. (C.) algeri* n.sp. from Panama. The subgenus was previously only known from the type species, *C. (C.) perpectinata* (Michener) from Panama. A key is provided for the identification of the currently recognized species.

*Key Words:* Augochlorini, *Caenaugochlora*, *Ctenaugochlora*, Halictidae, new species.

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The genus *Caenaugochlora* is a wide ranging (Ecuador to Mexico) group of halictid bees from the New World tribe Augochlorini. Two subgenera are recognized within the genus—the nominate subgenus with 13 described species; and the subgenus *Ctenaugochlora* containing only the type species, *Caenaugochlora perpectinata* (Michener) (Moure and Hurd, 1987). A third subgenus will be described in a forthcoming paper. The biology of one species, *C. costaricensis* (Friese), has been studied by Michener and Kerfoot (1967: as *Pseudaugochloropsis costaricensis*). This species nests in the ground, constructing a short turret around the nest entrance. The nests are composed of a simple tunnel leading to a cell chamber, usually with a short terminal burrow. The species is likely to be semisocial.

During my systematic studies of the genera and subgenera of the augochlorine bees, I have come across additional species of some groups previously represented by only a single species, one of these being *Ctenaugochlora*. *Ctenaugochlora* can most readily be separated from the nominate subgenus by the peculiar pectination of the inner hind tibial spur, with over 10 long teeth closely packed together (Fig. 2), and by the lack of long eye hairs. Herein I provide descriptions of three new species for this subgenus in order to have their names available for upcoming studies of relationships within the tribe. All measurements were made with an ocular micrometer on a WILD-M5a microscope.

***Caenaugochlora (Ctenaugochlora) beethoveni*, new species**

**Description:** Female (male unknown); total body length 8.72 mm; forewing length 6.56 mm. Head as long as wide. Width of gena roughly equal to compound eye in profile. Angle of epistomal sulcus orthogonal (measured between lateral clypeo-genal sulcus and dorsal clypeo-genal sulcus with angle opening towards compound eye: *sensu* Eickwort, 1969). Distal half of clypeus extending beyond lower margin of compound eyes; clypeus and supraclypeal area very slightly rounded and only very slightly protuberant in profile, face relatively flat; supraclypeal area about as long as wide. Mandible short, monodentate and blunt; subapical tooth very weakly defined.

Labral basal elevation U-shaped and slightly bilobed due to medial impression; distal extension narrowly triangular. Frontal line carinate between antennae, becoming a weak impression half way between antenna and median ocellus. Scape length 1 mm; pedicel longer than flagellomere I; flagellomere I roughly as long as wide; flagellomeres II, III, and IV each as long as wide and longer than I; flagellomeres V, VI, and VII each as long as wide and longer than II, III, or IV; remaining flagellomeres progressively longer than each other; distal flagellomere longer than wide (length 0.36 mm; width 0.22 mm). Ocelli normal, not enlarged; median ocellus to lateral ocellus 0.08 mm; between lateral ocelli 0.22 mm; lateral ocellus to compound eye 0.24 mm. Compound eyes strongly emarginate, weakly convergent below; with short eye hairs. Vertex short. Preoccipital ridge carinate. Proboscis length 1.06 mm; width 0.38 mm. Hypostomal ridge carinate, not projecting beyond posterior margin of head, anterior angle rounded. Mouthparts normal, not greatly elongated or narrowed. Pronotal lateral angle slightly obtuse; lateral ridge sharply angled; dorsal ridge carinate. Scutum broadly rounded anteriorly, with slight median dimple; mesoscutal lip rounded, slightly projecting over pronotum; median and parapsidal lines weakly impressed. Tegula rounded; intertegular distance 1.58 mm. Scutellum flat, one and a half times longer than metanotum. Subpleural signum slightly protuberant, blunt. Propodeal triangle slightly shorter than scutellum; propodeal dorsal ridge rounded, lateral ridge carinate. Wing veins brown; basal vein distad of cu-v crossvein (offset by four times the width of a vein); 1r-m confluent with 1m-cu; 2r-m distad of 2m-cu (offset by two times the width of a vein). First submarginal cell slightly wider than second and third combined (measured along a median axis); second submarginal cell only slightly narrower anteriorly than posteriorly; anterior border of second submarginal cell along Rs roughly equal to anterior border of third submarginal cell; marginal cell apex truncate and feebly appendiculate; wings hyaline. Hind tibia inner surface slightly concave and broad. Basitibial plate narrowly rounded, not defined anteriorly, weakly defined posteriorly. Inner hind tibial spur pectinate, all teeth long and closely packed, 13 teeth (not including apex as a tooth). Metasoma unmodified.

Mandible black with red-brown apex. Head entirely black, not shining. Clypeus finely coriaceous (appearing leathery) with scattered weak punctures; supraclypeal area finely granular; remainder of face with small close punctures; punctures separated by less than puncture width; integument otherwise finely granular. Scape black, basal tip with some light brown coloration; remainder of antenna dark brown. Gena and postgena costate. Pronotum finely imbricate, dark brown and polished. Mesosoma, except pronotum, black. Scutum closely punctate; punctures separated by less than puncture width; medially finely granular. Tegula dark brown with light brown, semi-translucent outer border; surface coriaceous. Scutellum punctate; integument between punctures granular. Metanotum impunctate and granular. Propleuron coriaceous. Pre-episternum rugose. Hypo-epimeral area costate; mesepisternum costate anteriorly becoming coriaceous on posterior two-thirds. Metepisternum costate dorsally, coriaceous basally. Propodeal triangle with strong diverging striae, radiating from basal margin; surface between striae coriaceous. Propodeal lateral surface coriaceous. Legs entirely dark brown, except foretarsi light brown; surfaces finely imbricate. Inner surface of hind tibia smooth and shining. All terga dark red-brown

with finely imbricate surfaces; anterior half of first tergum smooth. Sterna dark brown and imbricate.

Face with widely scattered, moderately long, dark hairs, some with very short branches; few short, pale hairs along lower inner margin of compound eye. Gena with moderately long pale, branched hairs; such hairs more widely separated on postgena. Pronotal dorsal surface without hairs, laterally with extremely short, simple, silvery hairs. Scutum with widely scattered short, dark hairs that become longer and branched along anterolateral margins. Tegula with short, suberect hairs on anterior half; hairs with a few short branches. Hairs of scutellum like those of central disc of scutum. Hairs of metanotum longer and branched. Pleura with widely scattered simple hairs. Propodeal triangle without hairs; propodeal lateral surface with long, plumose hairs; posterior surface with extremely short, pale hairs and a few longer, branched hairs. Procoxa with simple hairs; trochanter and femur posteriorly with simple hairs, sometimes with 1–3 short branches; outer surface of tibia with short, stiff, simple hairs; hairs black basally becoming light brown or white apically; tarsi with long, stiff, simple hairs on outer surfaces, same color pattern as those of tibia. Pubescence of middle legs similar to that of fore legs. Hind trochanter and femur with scopa formed of long, plumose hairs; outer posterior surface of tibia with moderate, simple, black hairs; hairs of anterior surface with several branches; inner surface of tibia lacking hairs; basitarsal outer surface with black hairs, posterior margin with pale hairs; tarsi II and III with black hairs; remainder of tarsus with brown hairs. Anterior half of tergum I with moderately long, simple hairs. Posterior half of tergum I and entirety of remaining terga with more widely scattered, shorter, simple hairs that become slightly longer along lateral margins. Sterna with long, simple hairs; hairs sometimes with a few branches.

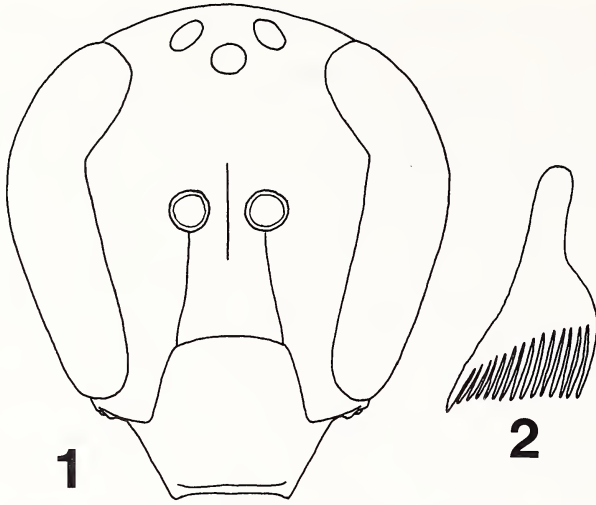
**Holotype:** Female, Costa Rica, Puntarenas Prov., Monteverde, 26 June 1981, S. Knapp, Nr. 0047. Deposited in the Cornell University Insect Collection.

**Etymology:** This species is named in honor of the German composer, Ludwig van Beethoven (1770–1827). A lovely personal account of the Maestro's life is given by Breuning (1874).

### ***Caenaugochlora (Ctenaugochlora) donnae*, new species**

Fig. 1

**Description:** As in *C. beethoveni*, except as follows: Female (male unknown); total body length 9.48 mm; forewing length 7.36 mm. Head longer than wide (Fig. 1). Distal two-thirds of clypeus extending beyond lower margin of compound eyes; clypeus and supraclypeal area gently rounded and slightly protuberant in profile; supraclypeal area one and a half times longer than wide. Mandible slender; subapical tooth well defined. Frontal line carinate between antennae, becoming weakly impressed line shortly above level of antennal sockets. Scape length 1.1 mm; pedicel slightly shorter than flagellomere I; flagellomere I longer than wide; flagellomere II wider than long, not as long as I; flagellomeres III–VII each as long as wide, each longer than I; flagellomeres VIII and IX each as long as wide and longer than previous flagellomeres; distal flagellomere longer than wide. Median ocellus to lateral ocellus 0.08 mm; between lateral ocelli 0.24 mm; lateral ocellus to compound eye 0.24 mm. Proboscis fossa length 1.32 mm; width 0.36 mm. Pronotal lateral



Figs. 1-2. 1. *Caenaugochlora* (*Ctenaugochlora*) *donnae* n.sp., frontal aspect of head. 2. *Caenaugochlora* (*Ctenaugochlora*) *algeri* n.sp., inner hind tibial spur.

angle obtuse; lateral ridge rounded. Scutum broadly rounded anteriorly, with slight medial dimple; mesoscutal lip rounded, slightly projecting over pronotum; median and parapsidal lines fairly impressed. Intertegular distance 1.7 mm. Scutellum biconvex due to slight median depression, twice as long as metanotum. Subpleural signum strongly tuberculate, somewhat pointed. Propodeal triangle roughly equal to length of scutellum. Propodeal lateral ridge rounded. Wing veins dark brown. Inner hind tibial spur with 12 teeth (not including apex as a tooth).

Mandible black, somewhat red at apex, basally with metallic turquoise highlights. Face mostly brilliant metallic purple with turquoise highlights at antennal sockets and along eyes; sculpturing as in *C. beethoveni*, except punctures of supraclypeal area more dense about antennal sockets. Antenna brown. Gena and postgena metallic blue with purple highlights. Mesosoma entirely brilliant metallic blue with strong purple and turquoise highlights. Punctures of scutum separated by more than puncture width about median line, otherwise separated by less than puncture width. Tegula dark brown; anterolateral margin light brown and semi-translucent, with purple highlights. Legs red-brown with strong purple highlights. Metasoma red-brown with strong purple and turquoise highlights, appearing completely blue unless viewed under microscope.

Pubescence generally lighter than in *C. beethoveni*. Hairs of metanotum simple. Hairs on pleura, propodeum, and metasoma golden.

**Holotype:** Female, Costa Rica, San Jose Prov., Pan-Am Hwy, 14 rd mi N San Isidro de General, ca. 1,600 m, 20-23 June 1974, W. A. Harding and J.P. Donahue. Deposited in the Natural History of Los Angeles County.

**Etymology:** This species is named in loving honor of my mother, Donna G. Engel.

**Caenaugochlora (Ctenaugochlora) algeri**, new species

Fig. 2

**Description:** As for *C. beethoveni*, with the following modifications: Female (male unknown); total body length 8.78 mm; forewing length 6.24 mm. Head slightly wider than long. Clypeus and supraclypeal area gently rounded and slightly more protuberant than in *C. beethoveni*. Mandible slender, bidentate; subapical tooth strong making mandible appear tridentate. Scape length 1.02 mm. Median ocellus to lateral ocellus 0.1 mm; between lateral ocelli 0.28 mm; lateral ocellus to compound eye 0.28 mm. Proboscis fossa length 0.96 mm; width 0.42 mm. Pronotal lateral angle obtuse. Intertegular distance 1.8 mm. Scutellum one and one-third times longer than metanotum. Propodeal triangle shorter than scutellum, but longer than metanotum. Propodeal dorsal ridge carinate. Wing veins brown basally, apically light brown; basal vein distad of cu-v crossvein (offset by two times the width of a vein). Anterior border of second submarginal cell along Rs longer than anterior border of third submarginal cell. Inner hind tibial spur with 14 teeth, not including apex as a tooth (Fig. 2).

Mandible black with reddish apex, basally with metallic blue-green highlights. Head black with blue-green highlights on clypeus and inner margins of eye; gena and postgena with similar highlights. Sculpturing as in *C. beethoveni*, except supraclypeal area punctate like remainder of face. Mesosoma black. Scutum punctate over entire surface, punctures essentially confluent. Tegula dark brown with blue-green highlights. Scutellum sculptured as on scutum. Metanotum rugose. Pleura rugose and punctate. Propodeal triangle as in *C. beethoveni*, except integument between striae smooth and shining. Propodeal lateral surface punctate. Legs black with a few blue-green highlights. Metasoma brilliant metallic gold, with strong metallic green highlights laterally and weaker metallic red-orange highlights apically. Anterior half of tergum I with strong punctures widely scattered. Remainder of tergum I, terga II and III all strongly punctate, punctures separated by puncture width or less. Terga IV and V with widely scattered, weak punctures, otherwise smooth and shining; metallic green coloration stronger than on previous terga. Sterna dark brown.

Pubescence as for *C. beethoveni*, except hairs of scutum more numerous, hairs on anterior half of tegula more dense, and a few long, black hairs on tergal lateral margins.

**Holotype:** Female, Panama, Panama Prov., Chepo, 6 km NE C rd, 24 November 1982, D. Roubik, Nr. 57. Deposited in the Cornell University Insect Collection.

**Etymology:** This species is named in loving honor of my father, Rev. Alger G. Engel.

KEY TO DESCRIBED SPECIES OF CTENAUGOCHLORA

- 1. Metasomal terga I-III closely punctured; punctures strong and separated by a puncture width or less. . . . . 2
- Metasomal terga I-III impunctate. . . . . 3
- 2. Propodeal dorsal ridge carinate; metasoma metallic gold; scape entirely black; wings hyaline. . . . . *algeri*
- Propodeal dorsal ridge rounded; metasoma black; scape mostly light brown; anterior portion of forewings darker than remainder of wing. . . . . *perpectinata*

3. Entire bee brilliant metallic blue; subpleural signum strongly tuberculate; head distinctly longer than wide; scutellum weakly biconvex due to median depression. . . . . *donnae*  
 Body black; subpleural signum normal; head roughly as long as wide; scutellum flat, lacking a median depression. . . . . *beethoveni*

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